

SEQUENCE OF OPERATIONS

1.01 GENERAL: CONTROLS CONTRACTOR SHALL CLOSELY COORDINATE WITH MECHANICAL CONTRACTOR DURING BIDS TO CONFIRM WHICH PARTY WILL PURCHASE THE VENTURI VALVES AND SPECIALTY TOUCHSCREEN CONTROLLER/MONITORS. INCLUDE CONFIRMATION OF THIS COORDINATION BY SHOWING ALL COMPREHENSIVE DIVISION OF INSTALLATION, AND PURCHASING, RESPONSIBILITIES WITHIN THE BID FORM SUBMISSION.

2.01 DDC PHOENIX SUPPLY AIR VALVES WITH REHEAT A. CONTROLS INTEGRATION: CONTROLS CONTRACTOR TO INTEGRATE ALL INPUTS/OUTPUTS FROM CRC PACKAGE CONTROLLERS TO PULL AIRFLOW DATA FROM CALIBRATED ORIFICE DEVICE VIA PACKAGED CONTROLLER. ALL

MODULATION AND CONTROL OF THESE AIRFLOW VALVES SHALL BE COMMANDED BY THE BUILDING AUTOMATION TO SEND A 0-10 VAC SIGNAL TO EACH AIR VALVE. 3. INITIAL BALANCE/CALIBRATION: REFER TO THE DRAWING FOR WORK ASSOCIATED WITH THE BALANCING CONTRACTOR TO FORM A BASELINE READING FOR THE REQUIRED SUPPLY/RETURN AIR OFFSET NECESSARY TO MAINTAIN THE ROOM PRESSURE SETPOINT (EACH SPACE SHALL BE INDIVIDUALLY BALANCED TO CONFIRM ACTUAL

SHALL ALSO BE TIED INTO THE ROOM'S PRESSURE SENSOR CONTROL PANEL TO INDICATE BOTH ROOM PRESSURE, AND AIRFLOW EXCHANGES RATES (IN AC/HR) DIRECTLY ON THE DISPLAY MONITOR. D. GENERAL: PRESSURE INDEPENDENT CONTROL OF UNIT SUPPLY AIR QUANTITY BETWEEN MAXIMUM AND MINIMUM VOLUME SET POINTS BY MONITORING SPACE TEMPERATURE AND USING PID ALGORITHMS TO MAINTAIN SPACE TEMPERATURE SET POINTS BY MODULATING THE SUPPLY AIR DAMPER AND CONTROL VALVE(S) FOR REHEAT COIL

. OCCUPIED/UNOCCUPIED MODE INDEXING: BY MASTER CONTROL UNIT, WITH TIMED OVERRIDE OF UNOCCUPIED CYCLE INITIATED BY MANUAL SWITCH AT SPACE TEMPERATURE SENSOR/CONTROLLER. 2. <u>OPERATION</u>: DIRECT ACTING CONTROL WITH ADJUSTABLE DEAD BAND BETWEEN HEATING AND COOLING SET

a. <u>SPACE TEMPERATURE</u>: COMPARED TO SET POINTS. b. <u>SUPPLY AIR DAMPER</u>: MODULATED TO MAINTAIN FIXED AIRFLOW SET POINT (CONSTANT FLOW — REFER TO EQUIPMENT SCHEDULE FOR OCCUPIED/UNOCCUPIED AIRFLOW RATES)

c. SUPPLY AIR VOLUME: LIMITED BY FIXED AIRFLOW VOLUME SET POINTS. d. HEATING VALVE(S): MODULATED TO MAINTAIN SPACE TEMPERATURE HEATING SET POINT.

a. SPACE TEMPERATURE COOLING 1) OCCUPIED: 70°F OR AS ESTABLISHED BY USER.

b. <u>SPACE TEMPERATURE HEATING</u>: 1) OCCUPIED: COOLING SET POINT MINUS DEAD BAND.

c. <u>SPACE TEMPERATURE DEAD BAND</u>: 2°F. . UNOCCUPIED MODE: SUPPLY VALVE WILL REDUCE CONSTANT VOLUME AIRFLOW SETPOINT TO THE MINIMUM AIR OSITION INDICATED ON EQUIPMENT SCHEDULES. RETURN AIR VALVE WILL AUTOMATICALLY COMPENSATE TO

F. DDC POINTS SUMMARY: FIELD INTERFACE SPACE CONTROL MODULE ANALOG INPUT 1/BOX VAV BOX AIR FLOW SENSOR ANALOG INPUT 1/BOX ANALOG OUTPUT VAV BOX DAMPER ACTUATOR SPACE TEMPERATURE SET POINT 1/ZONE ANALOG INPUT SPACE CONTROL MODULE 1/BOX ANALOG OUTPUT VALVE ACTUATOR(S) 3. <u>ADDITIONAL NOTES</u>: CONTROLS CONTRACTOR SHOULD REFER TO DRAWING KEY NOTES FOR SOME SPACE

2.02 DDC PHOENIX AIR VALVES WITHOUT REHEAT (RETURN AIR) E. CONTROLS INTEGRATION: CONTROLS CONTRACTOR TO INTEGRATE ALL INPUTS/OUTPUTS FROM CRC PACKAGE CONTROLLERS TO PULL AIRFLOW DATA FROM CALIBRATED ORIFICE DEVICE VIA PACKAGED CONTROLLER. ALL MODULATION AND CONTROL OF THESE AIRFLOW VALVES SHALL BE COMMANDED BY THE BUILDING AUTOMATION

TO SEND A 0-10 VAC SIGNAL TO EACH AIR VALVE. F. INITIAL BALANCE/CALIBRATION: REFER TO THE DRAWING FOR WORK ASSOCIATED WITH THE BALANCING CONTRACTOR TO FORM A BASELINE READING FOR THE REQUIRED SUPPLY/RETURN AIR OFFSET NECESSARY TO MAINTAIN THE ROOM PRESSURE SETPOINT (EACH SPACE SHALL BE INDIVIDUALLY BALANCED TO CONFIRM ACTUAL ROOM TIGHTNESS OF EACH AREA).

VOLUME SET POINTS BY MONITORING SPACE TEMPERATURE AND USING PID ALGORITHMS TO MAINTAIN ROOM PRESSURIZATION SET POINTS BY MODULATING THE RETURN AIR DAMPER. 1. OCCUPIED/UNOCCUPIED MODE INDEXING: N/A

2. OPERATION: DIRECT ACTING CONTROL WITH ADJUSTABLE DEAD BAND BETWEEN HIGH/LOW ROOM PRESSURE a. <u>RETURN AIR DAMPER</u>: MODULATED TO MAINTAIN SPACE PRESSURE PARAMETERS. b. <u>RETURN AIR VOLUME</u>: LIMITED BY MINIMUM AND MAXIMUM VOLUME SET POINTS. PROVIDE TIME DELAY TO PREVENT OVER CORRECTION.

a. <u>ROOM PRESSURE SETPOINT</u>: +6.0 PA (OPERATING ROOMS), OR +2.5 PA (STERILE SUPPLY AND SCRUB

b. <u>SPACE PRESSURE DEAD BAND</u>: +/- 1 PA H. DDC POINTS SUMMARY:

FIELD INTERFACE DIFFERENTIAL PRESSURE TO SUITE 1/ZONE ROOM PRESSURE MONITOR ANALOG INPUT VAV BOX AIR FLOW SENSOR 1/BOX ANALOG OUTPUT VAV BOX DAMPER ACTUATOR 1/BOX ANALOG INPUT SPACE CONTROL MODULE

2.03 ROOM PRESSURE MONITOR INTEGRATION

. GENERAL: ALL POINTS AVAILABLE FOR THE ROOM PRESSURE MONITORS SHALL BE INTEGRATED INTO THE CENTRAL BUILDING AUTOMATION SYSTEM THROUGH THE FACTORY SUPPLIED BACNET PROTOCOL. IN ADDITION, ACTUAL ROOM VOLUMES SHALL BE PROGRAMMED INTO EACH INDIVIDUAL ROOM PRESSURE MONITOR TO SHOW AIR CHANGES/HOUR ON BOTH THE CENTRAL AUTOMATION COMPUTER AND ON THE ACTUAL ROOM PRESSURE MONITOR PANEL ALSO. PROVIDE ALL WIRING BETWEEN PRESSURE MONITOR AND REMOTE PRESSURE SENSORS ALONG WITH OUTPUT WIRING TO RETURN AIR VALVE TO CONTROL ROOM PRESSURIZATION (REFER TO RETURN

AIR VALVE WITHOUT REHEAT CONTROL SEQUENCE ABOVE). E. <u>CONTROLLER VS MONITOR:</u> CONTROLS CONTRACTOR HAS OPTION TO EITHER ALLOW CRC ROOM PRESSURE MONITOR SPECIFIED CONTROL THE ACTUAL PRESSURIZATION SEQUENCING. OR TO PULL OUTPUT DATA AND PROVIDE THEIR OWN SEQUENCE THROUGH THE BUILDING AUTOMATION SYSTEM. EITHER OPTION WILL REQUIRE FULL INTEGRATION TO ALLOW REMOTE SETPOINT ADJUSTMENTS AND MONITORING VIA THE CENTRAL AUTOMATION COMPUTER. COORDINATE METHOD, AND FINALIZED WIRING DIAGRAMS, WITH ENGINEER OF RECORD VIA

F. DOOR SWITCH DELAY: PROVIDE A PROGRAMMED DELAY IN ALARM, AND VENTURI VALVE RESPONSE, WHEN DOOR SWITCH INDICATES A OPEN POSITION. FINE TUNE THIS DELAY SEQUENCE WITH FACILITIES TO REDUCE MOMENTARY FALSE ALARMS, OR OVER-REACTION OF SYSTEM DAMPERS, DURING FINAL SYSTEM COMMISSIONING

G. DDC POINTS SUMMARY: FIELD INTERFACE ROOM PRESSURE PANEL SEE DRAWINGS USER INPUT 1/SENSOR USER INPUT ROOM PRESSURE PANEL PRIMARY ROOM AIRFLOW/PRESSURE ROOM PRESSURE SENSOR 1/SENSOR ANALOG OUTPUT SECONDARY ROOM AIRFLOW/PRESSURE ROOM PRESSURE SENSOR 1/SENSOR ANALOG OUTPUT PRIMARY ROOM TEMPERATURE 1/SENSOR ANALOG OUTPUT ROOM PRESSURE SENSOR 1/SENSOR ANALOG OUTPUT ROOM PRESSURE SENSOR DIGITAL OUTPUT MULTIPLE ROOM PRESSURE

DIGITAL OUTPUT

DOOR SWITCH

2.04 COMPUTER ROOM COOLING UNIT INTEGRATION

H. GENERAL: CONTROLS CONTRACTOR TO FIELD WIRE ALL LOOSE COMPONENTS, INCLUDING REMOTE CONTROL PANEL SENSOR, AS REQUIRED FOR COMPLETE INSTALLATION. MECHANICAL CONTRACTOR TO PURCHASE UNIT WITH BACNET COMPATIBLE NETWORK CARD FOR FULL INTEGRATION INTO BUILDING AUTOMATION SYSTEM. CONFIRM ALL PROGRAMMING, AND GRAPHICS PACKAGES, REQUIRED FOR THIS FULL INTEGRATION OF THE PACKAGED UNIT CONTROLLER. CHILLED/HIGH TEMP LOOP SWITCHOVER: MECHANICAL CONTRACTOR TO INSTALL VALVES FOR MANUAL SWITCHOVER. INTEGRAL CONTROLS PACKAGE SHALL MONITOR INCOMING WATER TEMPERATURE TO CYCLE

SEE DRAWINGS

2.05 ELECTRONIC CANISTER HUMIDIFIER INTEGRATION

E. GENERAL: CONTROLS CONTRACTOR TO FIELD WIRE ALL LOOSE COMPONENTS, INCLUDING REMOTE HUMIDISTAT AND HIGH LIMIT SAFETY/AIRFLOW SWITCHES, AS REQUIRED FOR COMPLETE INSTALLATION. MECHANICAL CONTRACTOR TO PURCHASE UNIT WITH BACNET COMPATIBLE NETWORK CARD FOR FULL INTEGRATION INTO BUILDING AUTOMATION SYSTEM. CONFIRM ALL PROGRAMMING, AND GRAPHICS PACKAGES, REQUIRED FOR THIS FULL INTEGRATION OF THE PACKAGED UNIT CONTROLLER.

CHILLED/HIGH TEMP LOOP SWITCHOVER: MECHANICAL CONTRACTOR TO INSTALL VALVES FOR MANUAL SWITCHOVER. INTEGRAL CONTROLS PACKAGE SHALL MONITOR INCOMING WATER TEMPERATURE TO CYCLE INTERNAL 3-WAY VALVE BETWEEN WATER COOLED COMPRESSORS AND CHILLED WATER COIL.

3.01 CONTROL CONTRACTOR ASSISTANCE IN COMMISSIONING OF ALL SYSTEMS G. <u>GENERAL</u>: CONTROLS CONTRACTOR WILL BE REQUIRED TO FULLY PARTICIPATE IN ALL COMMISSIONING ACTIVITIES. COORDINATE SCHEDULE WITH BOTH COMMISSIONING AGENT AND MECHANICAL CONTRACTOR FOR TESTING OF ALL SYSTEMS EITHER NEWLY INSTALLED, OR SIGNIFICANTLY MODIFIED, AS PART OF THIS PROJECT.

NOTE: THE DDC CONTROL POINT LISTS SHOWN ARE BRIEF SUMMARIES ONLY AND NOT INTENDED TO BE A FULL COMPREHENSIVE LIST OF SENSORS AND/OR CONTROL POINTS REQUIRED TO FULLY COMPLY WITH THE OPERATIONAL SEQUENCE. IT WILL BE THE CONTROL CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL REQUIRED POINTS AND INCLUDE COMPLETE SHOP DRAWINGS SHOWING THE FULL LIST OF CONTROL POINTS FOR INTEGRATION TO THE BUILDING AUTOMATION SYSTEM. CONTROLS CONTRACTOR SHALL PROVIDE FULL BUILDING FLOOR PLAN GRAPHICS AND SYSTEM CONTROL GRAPHICS PER THE 2005 UMMC MASTER SPECIFICATION FOR INTERIOR REMODELING PROJECTS. PLEASE REVIEW AND FORWARD ANY QUESTIONS, OR REQUIRED CLARIFICATIONS, TO THE ENGINEER OF RECORD.

> 100% CD ISSUE FULLY SPRINKLERED

REFERENCE ONLY - N.I.C.

Project No.

VA Proi # 618-CSI-100

**Building Number** 

BWBR Proj # 3.2012151,00

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> Office of Facilities Management

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THE WORK WILL BE MADE WITHOUT THE PRIOR APPROVAL OF THE PROJECT ENGINEER.

BY THE VARIOUS SUBCONTRACTORS.

DATE

GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR GENERAL DEMOLITION INCLUDING REMOVAL OF WALLS, PARTITIONS, DOORS &

Z RESPONSIBILITY. CORE DRILLING THROUGH CONCRETE WALLS, FLOORS OR STRUCTURE FOR PIPING OR CONDUIT SHALL BE THE

 $\stackrel{\square}{\sqcup}$  RESPONSIBILITY OF THE SUBCONTRACTOR BY TRADE; FIRESTOPPING OF THESE OPENINGS SHALL BE DONE BY THE RESPECTIVE

ECEILING & FLOORS. ANY AND ALL CUTTING OF CONCRETE FLOORS, WALLS OR STRUCTURE SHALL BE THE GENERAL CONTRACTOR'S

SUBCONTRACTOR. REMOVAL OF DEBRIS RESULTING FROM DEMOLITION, CUTTING, AND/OR DRILLING IS THE RESPONSIBILITY OF THE

GENERAL CONTRACTOR. PATCHING AND REPAIR OF CONCRETE WALLS, FLOOR, OR STRUCTURE SHALL BE THE RESPONSIBILITY OF THE

GENERAL CONTRACTOR: THIS WILL BE ACCOMPLISHED UPON COMPLETION OF THE INSTALLATION OF ANY AND ALL UTILITIES INSTALLED

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one-eighth inch = one foot

0 4 8 16

REVISIONS

TRUE NORTH mechanical + electrical consulting engineering PLAN NORTH

JASON GOTTWALT PE Date **03/30/2015** Reg. No. 41360 Drawing Scale AS NOTED

12" = 1'-0"

Plot Scale

## **PLANS**

Approved: Cynthia Doolittle, Chief, Projects Section

Approved: Steven Challeen, Director, Engineering

V.A. MEDICAL CENTER ONE VETERANS DRIVE MINNEAPOLIS, MN 55417 Location  $\bigvee \Delta$ Checked

PHASE TWO

03/30/2015

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DRAWING NO. 1305-MH01.2 Dwg. 20 Of 44

Veterans Affairs